ciated with Bt for humans who consume bioengineered foods. Says Beachy, "The risk in food is little or none because this bacterium and its proteins have been in our food chain for many years. To reduce the chemical load on the land by using Bt products far outweighs the potential negative impact."

Dioxin in Russia

Six American and Canadian dioxin and environmental specialists met with 40 Russian scientists, NGO representatives, and policy makers over a period of 10 days in October 1996 to discuss dioxin contamination in the environment and in humans. This delegation of experts, which met in the Russian cities of Moscow and Ufa, was organized by CEC International Partners, formally the Citizen Exchange Council, a nonprofit group that aids the Newly Independent States (NIS) of the former Soviet Union and 22 countries of Eastern Europe in acquiring knowledge and resources to deal with environmental issues. Looming environmental problems, such as dioxin contamination, have become more apparent since the former Soviet Union opened to the West.

"Our role was to act as educators and listeners," said delegation member Linda Birnbaum, director of the Experimental Toxicology Division at the U.S. EPA's National Health and Environmental Effects Research Laboratory in Research Triangle Park, North Carolina, and a leading authority on dioxin research. "Many of the Russian people who are the most concerned [about dioxin contamination] don't know much about it," she said.

Dioxins are extremely toxic and persistent pollutants that bioaccumulate in the body. Health problems that have been linked to dioxin exposure in humans include cancer, reproductive dysfunction, endocrine disruption, and immune suppression. In February 1997, the International Agency for Research on Cancer in Lyon, France, declared TCDDs (one family of dioxins) "probable human carcinogens."

Scott Masten, research fellow in the Laboratory of Computational Biology and Risk Analysis at the NIEHS and a delegation member, said, "The problem of dioxin contamination is definitely not being given as much attention in Russia, and the extent of contamination is at least as bad as it is in the U.S." The United States and Russia contain high levels of dioxin contamination, in part due to the prevalence of chemical manufacturing and paper bleaching, compared to nonindustrial countries in the world.

However, Russia's ability to deal with environmental contamination has, until recently, been severely restricted by the censoring of scientific information about dioxin in the former Soviet Union. "The Soviet military viewed dioxin as a potential chemical weapon. Only military scientists had access to information," said Jennifer Adibi, director of the EcoBridge Environmental Programs at CEC. "Until very recently, the word dioxin could not even be found in the [Russian] dictionary." This censorship has resulted in Russia lagging 25 years behind the United States in access to literature on dioxin. "The Russians have been fairly cut off," said Birnbaum, "and they are eager to listen and learn."

As a result of the coalition, the Russian delegates sent a letter to Russian Prime Minister Viktor Chernomyrdin and U.S. Vice President Al Gore. The letter requested that the dioxin problem be added to the agenda of the next Gore–Chernomyrdin Commission (GCC) meeting in February in Washington, DC. Unfortunately, according to Gary Waxmonsky, executive secretary of the Environmental Committee of GCC, the commission was not informed of the subject in time to include dioxin on the February agenda. However, there is some indication that it will be addressed at a later GCC meeting.

In early February, the Russian federal government announced the allocation of 7.5 billion rubles ($1.47 million) for the Russian federal dioxin program. "This is a huge step in the right direction, but we cannot really believe it until we see it," said Adibi, expressing fear that the money may be diverted to other Russian programs. "But when the issue does make it onto the agenda of the GCC," she says, "there is a good chance that part of U.S. assistance to the NIS will be allocated towards dioxin collaboration."

Future collaborations are expected as a result of the October meetings. Arnold Schecter, professor of preventive medicine at the State University of New York in Binghamton and a leading authority on dioxin, said, "The population [in Russia] could provide clinical information on dioxin exposure. There is almost no environmental epidemiology information. It is a valuable resource that has been identified." Schecter hopes this resource may be more easily tapped as a result of work like that done by the coalition in October. "[Russian scientists] have no money for equipment, supplies, journals, travel, or salaries," said Schecter. The CEC-organized meetings were useful in raising concern about the problem of dioxin and the need for funding for dioxin research in Russia.

Already, several collaborative research proposals have been submitted involving U.S. and NIS scientists working together on the dioxin issue. "As a result of the October meetings, much interest has been generated on both sides and we have begun work on collaborative efforts," said Adibi. "The main obstacle at this point is funding and reliable communication."

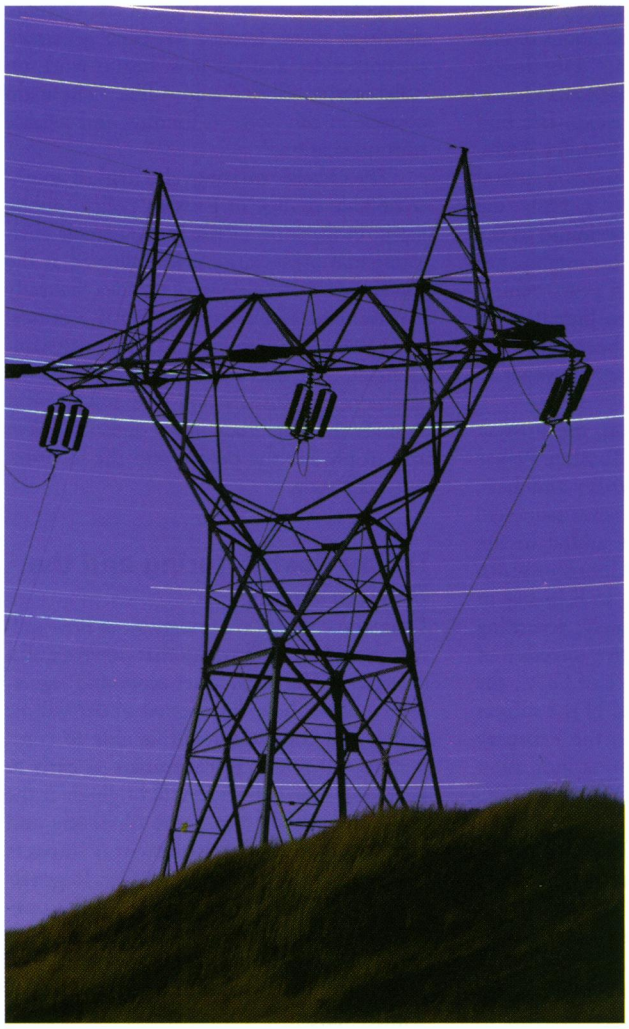
The October meetings also marked another notable change in Russian policy: public input, in the form of Russian grassroots environmental organizations, was allowed at the conference in recognition of the idea that early involvement of all stakeholders is a critical component of environmental health risk management. The near future will determine the resolve of the Russians and their collaborators to study the magnitude of the dioxin problem and to protect the people and the environment of Russia.

Utility Restructuring and the Environment

Dramatic changes are underway in how utilities provide the electricity that powers much of society. The usual strict economic regulations utilities have functioned under will be easing and companies will be able to compete to sell power to consumers as early as next year. The lights will still brighten at the flick of a switch, but some observers and analysts forecast environmental impacts resulting from utility restructuring. In generating electricity, utilities also generate one-third of all nitrogen dioxide, one-third of the greenhouse gases, and over two-thirds of the sulfur dioxide produced annually in the United States.

The changes in the estimated $200 billion a year business result from the 1992 Federal Energy Policy Act and a 1996 decision by the Federal Energy Regulatory Commission (FERC) interpreting that act, known as order 888. The order, designed to foster competition and decrease electric rates, requires use of electric transmission lines for all utilities to be offered at the same price to all generators, a possible result being that electricity cheaply generated in one part of the country could undercut the local price in a distant region. For example, customers in the Northeast might save money by getting their electricity from Midwestern power plants instead of closer ones as they have traditionally done.

That prospect concerns analysts like Ned Helme of the Center for Clean Air Policy in Washington, DC. Helme foresees the possibility of coal plants in Ohio, which may be cheaper to run but have more hazardous environmental effects, lighting lamps in New York. "And that means considerably higher emissions [of nitrogen oxides], which help produce ozone, carbon dioxide, and mercury."



Energy efficient? Deregulating electric utilities may provide competition and lower prices, but some wonder about the potential environmental costs.

But Gordon Hester, an energy specialist at the utility-funded Electric Power Research Institute (EPRI), cautions against such worries. EPA regulations based on modeling by the Ozone Transport and Assessment Group, an ad hoc group of EPA and state officials, industry, and environmental groups, showing that ozone travels several hundred miles may force the Midwestern utilities to reduce their NOx emissions. Hester also says the EPA's tougher proposed new ozone and particulate standards, if passed, could help curtail utility-caused emissions. But such standards would not go into effect for several years.

Deregulated electricity may also mean that factories will substitute electricity for more polluting industrial processes. For example, according to Howard Gruenspecht, an analyst studying the impact of electric utility restructuring for the Department of Energy, there has been a move in industries to replace paint drying, curing, and other processes that use fossil fuels such as oil with alternative technologies fueled by electricity. Such replacement may reduce net emissions of NOx because electric generators are subject to more stringent emission controls than many other industrial sources. Electric-powered technologies in steelmaking may also reduce pollutants such as coke emissions from coal-powered plants, according to an EPRI publication.

Another potential change is that more efficient and less polluting gas-powered plants may be built to provide electricity. Some gas-powered plants can be as much as 50% more efficient than coal-fired ones. For utilities competing with one another to provide power, such efficiency is quite important, notes Karen Palmer, an economist with Resources for the Future, a Washington, DC, think tank.

Public interest groups such as the Environmental Defense Fund are working to ensure that legislation such as the Schaefer Bill (HR 3790), which requires all states to introduce electricity competition, and FERC regulations governing restructuring will continue to improve environmental quality, says Donald Aitken, a scientist with the Union of Concerned Scientists. Among Aitken's concerns is the need to make sure that "green power" renewable energy sources, such as wind- and water-powered sources, are encouraged.

Gruenspecht says that under the present scheme of utility regulation, consumers can't plug into green power. "In a restructured environment there may be a significant opportunity there," he says. Helme points to surveys by several electric utility companies showing that 35–70% of customers say they are willing to pay a premium for green power.

Palmer notes that while state-mandated, utility-funded, energy efficiency programs are fading out in the face of deregulation, independent businesses are likely to fill that void. However, those services, now free to consumers, will come at a price. And the extent of such services, she says, remains a question.

Update on Gulf War Illness

The controversy over Persian Gulf War illnesses took a new turn this past year in light of information that some veterans may have been exposed to chemical weapons. In June 1996, the Department of Defense (DoD) revealed that nerve agents may have drifted over the desert when U.S. forces blew up an Iraqi weapons depot at Khamisiyah. As the DoD has released more evidence, the frustrating search for what might be the cause of the rashes, muscle pain, fatigue, headaches, and other mysterious symptoms of sick Gulf War vets has spawned a new theory: that low-level exposures to those nerve agents may explain some of these illnesses.

Researchers investigating this theory are focusing on the effects of low, possibly repeated doses of such agents because DoD medical teams in Iraq received no reports of clinical symptoms like those expected from doses large enough to cause nerve agent poisoning. However, the notion that such slight exposures could cause health effects years later is controversial.

The nerve agents, including sarin and soman, are similar to organophosphate pesticides, which can cause subtle, delayed nervous system damage at high doses. But research on low doses of nerve agents—for example, experiments involving 1,400 soldiers at Edgewood Arsenal, Maryland, from the 1950s to the 1970s—has turned up no evidence of long-term adverse health effects. "It seems profoundly unlikely that any significant number of people would have long-term effects if they had no immediate effects," said Sanford Leffingwell, an occupational and environmental physician and a consultant in Dacula, Georgia, who is an expert in developing health standards for nerve agent exposures at military bases.

But there are relatively few studies like the one in Maryland, and some researchers point to hints that nerve agents could cause delayed damage. For example, in a 1982 report published in *Neurobehavioral Toxicology and Teratology*, a group of researchers found that industrial workers accidentally exposed to doses of sarin high enough to cause toxic effects—as well as a handful of monkeys exposed to various doses of sarin (in some cases low, repeated doses)—had slightly altered electroencephalograms a year later, though no clear connection was identified between exposures and brain function.

Neurotoxicologist Peter Spencer of Oregon Health Sciences University in